Excitons at Semiconductor and Insulator Surfaces

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We investigate electron-hole excited states at semiconductor and insulator surfaces. The excited states are obtained from many-body perturbation theory (MBPT), evaluated within the GW approximation for single-particle excitations and employing the Bethe-Salpeter equation for electron-hole pairs. At semiconductor surfaces, like Si(111)-(2x1) or Si(001)-c(4x2), the excitons play a major role for the optical properties and for the interpretation of other spectroscopic data, like two-photon-photoemission experiments. In many cases, the interrelation of the excited state with the atomic structure is very important. One example is given by excitons at alkalihalide surfaces, like LiF(001)-(1x1) or KI(001)-(1x1), which lead to the emission of atoms after laser excitation.